MAP I-2018

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

GEOLOGIC MAP OF THE SURFICIAL DEPOSITS OF THE TOPOPAH SPRING QUADRANGLE, NYE COUNTY, NEVADA

By W C Swadley and D.L. Hoover

Prepared in cooperation with the
U.S. DEPARTMENT OF ENERGY

MISCELLANEOUS INVESTIGATIONS SERIES
Published by the U.S. Geological Survey, 1989

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CORRELATION OF MAP UNITS

Q1a, Q1b, Q1c	Q1ab	Holocene	QUATERNARY
Q2b, Q2c	Q2bc	Pleistocene	
Q2e	Q2s		
QTa		Pleistocene and Pliocene(?)	QUATERNARY AND TERTIARY(?)
Tr		Pliocene and Miocene	TERTIARY
MDr			MISSISSIPPIAN AND DEVONIAN

DESCRIPTION OF MAP UNITS

[Units are distinguished on the basis of lithology, surface morphology, relative age, and mode of deposition; these criteria are modified from Hoover and others (1981)]

A combined map symbol (**Q1b + Q1c**) is used where two Quaternary map units are interspersed at such a small scale that separate mapping was impractical. The first unit predominates in areal extent. A condensed map symbol (**Q1ab**) is used where two stratigraphic units are commonly mapped as a combined unit. Where a veneer of the younger unit masks but does not completely conceal the underlying unit, a fractional symbol ($\frac{Q1c}{Q2c}$) is used]

Holocene deposits—Alluvial deposits of present drainage system; Holocene age is inferred on the basis of limited soil development and correlation with Holocene deposits in nearby areas (Hoover and others, 1981, p. 25)

Q1a **Alluvial deposits**—Gravel, gravelly sand, silty sand, and thin lenses of silt; light gray to light brownish gray; poorly to moderately well sorted; poorly to well bedded; unconsolidated; commonly occur as discontinuous beds and lenses. Gravel is angular to subrounded and includes boulders as much as 1 m in diameter that are mostly reworked from nearby **Q1b** deposits. No soil development. Unit occurs in bottoms of modern washes; braided channels and gravel bars are common. Except in some larger washes, such as Fortymile Canyon, most **Q1a** deposits are too narrow to be mapped separately and are combined with unit **Q1b** as **Q1ab**. Maximum thickness probably less than 2 m

Q1b **Alluvial deposits**—Gravel, gravelly sand, silty sand, and silt; light gray to light brownish gray; poorly to moderately well sorted; poorly to well bedded; unconsolidated; commonly occur as discontinuous beds and lenses. Gravel is angular to subrounded and includes clasts as much as 1 m in diameter. Boulders, as trains and in patches, are locally abundant in fans deposited on steep slopes. Unit forms fluvial terraces commonly less than 1 m above modern washes and thin sheets and narrow fans downstream from incised parts of some drainages; surfaces of terraces and fans are very irregular, bar-and-swale topography and braided channels are common. Unit locally includes debris-flow deposits. Soil development is characterized by weak oxidation in B horizon. Unit forms wide fans along some washes tributary to Topopah Wash. Along washes in western part of quadrangle, **Q1b** deposits commonly are closely interspersed with channel deposits of **Q1a** that are too narrow to be shown separately on this map; the two units are commonly mapped together as unit **Q1ab**. Thickness 0–5 m, commonly less than 2 m

Q1ab **Alluvial deposits**—Combined map unit used where deposits of **Q1a** and **Q1b** are so closely interspersed that the two units cannot be mapped separately

Q1c **Alluvial deposits**—Gravel, gravelly sand, and silty sand; light brownish gray to pale yellowish brown; poorly to moderately well sorted; poorly to well bedded; slightly consolidated. Gravel is angular to subrounded; clasts commonly less than 0.5 m in diameter, but locally as large as 1 m; unconsolidated. Unit forms discontinuous terraces 1–3 m above most washes and thin fan deposits on units **Q2c** and **QTa**. Surface of **Q1c** is commonly smooth, in contrast to **Q1b**. Soil development consists chiefly of minor leaching of calcium carbonate in upper part and a weakly developed carbonate horizon (stage I of Gile and others, 1966); carbonate horizon characterized by thin carbonate coatings on bottoms of some clasts 0.5 m or more below the surface. Locally, deflation has produced a weakly developed surface lag deposit. Thickness 0–15 m

Late and middle Pleistocene deposits—Alluvial and eolian deposits. In the Nevada Test Site (NTS) area, these deposits have been divided into five map units based on lithology, depositional environment, and relative age as indicated by topographic position, amount of dissection, and degree of soil development (Hoover and others, 1981). Four of the five units are recognized in the quadrangle

Q2b **Alluvial deposits**—Gravel, sand, and silt; yellowish brown to grayish brown; poorly to moderately well sorted; massive to moderately well bedded; weakly consolidated. Gravel is subangular to rounded; clasts commonly less than 0.5 m in diameter. Sand and silt occur as matrix in gravel and as silty sand beds and lenses interbedded with gravel. Soil developed in **Q2b** has a light-brownish-gray vesicular A horizon composed largely of silt- and clay-size material, a light-brown cambic B horizon, and a stage I to II carbonate horizon that commonly has carbonate coatings on bottoms of clasts and minor filling of voids. Desert pavement is loosely to moderately well packed. Unit forms small inset terrace remnants 0.5–2 m below level of unit **Q2c** along some of the large washes and occurs as strath terraces cut on older units along major drainages. Differs from **Q2c** by weaker soil development and generally lower topographic position. Poorly exposed only in two washes near west border of quadrangle. Description largely from adjacent Jackass Flats 7 1/2-minute quadrangle (Swadley and Hoover, in press). A median age of about 170 ka has been inferred for **Q2b** deposits on the basis of several age determinations made using the experimental uranium-trend method on similar deposits from the Yucca Mountain area to the west (Rosholt and others, 1985; Swadley and others, 1984). Thickness 0–5 m

Q2c **Alluvial deposits**—Gravel, sand, and silt; yellowish gray to brownish gray; weakly to moderately well consolidated. Gravel is unsorted to moderately well sorted, poorly to well bedded, angular to subrounded; includes boulders commonly less than 1 m in diameter, but locally as much as 2 m. Sand and silt occur as matrix of gravel beds and in beds and lenses of gravelly sand and silty sand interbedded with gravel. Unit forms broad, smooth fans on piedmont slopes and terrace remnants along drainages incised into unit **QTa** and bedrock. Includes both fluvial and debris-flow deposits. Soils of at least two ages have developed in **Q2c** deposits. The older soils typically have a very pale brown vesicular **A** horizon, a partially silicified reddish-brown argillic B horizon, and a 1- to 2-m-thick stage IV carbonate horizon. The younger soils have a stage III carbonate horizon about 1 m thick overlain by a less silicified reddish-brown argillic B horizon and a vesicular A horizon similar to that of the older soils. Typically both the older and younger soils are overlain by a densely packed desert pavement. Commonly a well-developed black rock varnish coats surface gravels that are derived from volcanic rocks. An age of slightly older than 740 ka has been inferred for lower part of unit **Q2c** in the NTS area on the basis of its stratigraphic relations with eolian sand deposits (unit **Q2e** of Hoover and others, 1981), which locally contain beds of the 740-ka Bishop ash. Uranium-trend age determinations for **Q2c** deposits exposed in the Yucca Mountain area yielded ages of about 270 ka (Rosholt and others, 1985; Swadley and others, 1984), which is inferred to be the minimum age of unit **Q2c** in this area. Thickness 0–10+ m

Q2bc **Alluvial deposits**—Combined map unit used where units **Q2b** and **Q2c** cannot be distinguished on the basis of topographic position or geomorphic form. Units are mapped separately in areas of incised drainages where **Q2b** deposits are preserved as remnants of inset terraces (some too small to show at scale of this map) adjacent to deposits of **Q2c**. Locally, **Q2b** occurs as thin fan deposits that locally overlie fans or are closely interspersed with deposits of **Q2c** so as to make separation of the two units impractical. Where the two units are combined, **Q2c** is commonly the more extensive component

Q2e **Eolian deposits**—Sand; very pale orange to light brownish gray; fine to medium; well sorted; unconsolidated to weakly consolidated. Includes locally varying amounts of eolian sand reworked by slope wash and intermittent streams; these deposits contain scattered pebbles, cobbles, and gravel lenses. Near bedrock outcrops, sand commonly has a loosely to moderately well packed pavement of angular gravel. Unit poorly exposed in two small areas near south border of quadrangle; well exposed to the south in the Jackass Flats quadrangle (Swadley and Hoover, in press) from which this description is taken. In that quadrangle, unit forms large ramps of sand flanking bedrock hills, commonly on north- or south-facing slopes. Exposures at Busted Butte, 10 km south-southwest of this quadrangle, indicate that some of the larger ramps in the NTS area consist of as many as five superimposed eolian deposits separated by buried, carbonate-enriched soils. Surface soils formed in **Q2e** deposits typically consist of a 0.5- to 1.0-m-thick stage III carbonate horizon. Thickness 0–5 m

Q2s **Alluvial sand sheet deposits**—Sand; pale yellowish brown to yellowish gray; fine to medium; moderately well sorted; weakly consolidated; thinly bedded, locally crossbedded; contains as much as 10 percent gravel as scattered pebbles and pebble lenses and local silt and clay layers as much as 15 cm thick. Soils developed in **Q2s** typically include a vesicular A horizon and remnants of a reddish-brown argillic B horizon as much as 1 m thick underlain by a stage III to IV carbonate horizon less than 0.5 m thick. Desert pavement on **Q2s** surfaces varies from densely packed pavement with surface rocks coated with dark shiny rock varnish to loosely packed pavement with weakly developed rock varnish. Exposed only near south border of quadrangle where a thin sheet of sand overlies part of a **Q2c** alluvial fan. Description largely from adjacent Jackass Flats quadrangle (Swadley and Hoover, in press) where unit is better exposed. Uranium-trend ages determined for **Q2s** deposits in the Yucca Mountain area range from 480±90 ka to 270±90 ka (Rosholt and others, 1985; Swadley and others, 1984). Thickness 0–15 m

QTa **Early Pleistocene and Pliocene(?) alluvial deposits**—Chiefly unsorted cobble to boulder gravel, nonbedded to poorly bedded and moderately to well cemented by secondary carbonate. Unit is mostly debris-flow deposits and poorly sorted alluvium but locally includes fluvial deposits that are moderately well bedded, moderately well sorted pebble to cobble gravel with a silty sandy matrix. Gravel is angular to subrounded; includes boulders commonly less than 2 m in diameter. Unit forms alluvial fans flanking bedrock hills; fans are commonly dissected to form rounded, concordant ridges on upper slopes. Soil developed in unit **QTa** typically consists of a 2- to 3-m-thick carbonate horizon that has a stage IV carbonate development in upper part and includes silica lenses, and is locally overlain by remnants of a dark-reddish-brown argillic B horizon and by a more extensive vesicular A horizon similar to that of soils formed in middle and late Pleistocene deposits. Surface of **QTa** deposits generally has a densely packed desert pavement that includes numerous tabular fragments of pedogenic carbonate and opaline silica. This pavement locally is continuous with pavements developed on adjacent **Q2c** deposits. No age determinations have been made for unit **QTa**. In the NTS area, a minimum age greater than 740 ka is inferred based on the occurrence of **QTa** deposits that have a well-developed soil overlain by eolian sand deposits (unit **Q2e**) that contain beds of the 740-ka Bishop ash bed (Izett, 1982)

Tr **Tertiary rocks, undivided (Pliocene and Miocene)**—Ash-flow tuffs, ash-fall tuffs, rhyolitic and basaltic lavas, and minor amounts of intrusive rock. Mapped and described by Orkild and O'Conner (1970) and Maldonado (1985)

MDr **Mississippian and Devonian sedimentary rocks, undivided**—Dolomite, limestone, and argillite. Mapped and described by Orkild and O'Conner (1970) and Maldonado (1985)

Contact

Fault—Bar and ball on downthrown side. Shown in bedrock only if fault offsets adjacent surficial deposits

Lineament—Faint linear alignment of vegetation or topography on aerial photography; possibly fault related

PURPOSE OF STUDY

The study of the surficial geology of the Topopah Spring quadrangle was undertaken in order to locate faults that displace Quaternary deposits in this part of the Yucca Mountain region. Work was done in cooperation with the U.S. Department of Energy, Nevada Nuclear Waste Storage Investigations Project (Interagency Agreement DE-AI08-78ET44802), and is part of an evaluation of a potential radioactive waste repository at Yucca Mountain, approximately 8 km west of the map area. Other areas included in the study of the surficial geology of the Yucca Mountain region are shown in the index.

REFERENCES CITED

Gile, L. H., Peterson, F. F., and Grossman, R. B., 1966, Morphological and genetic sequences of carbonate accumulation in desert soils: Soil Science, v. 101, p. 347–360

Hoover, D. L., Swadley, W. C., and Gordon, A. J., 1981, Correlation characteristics of surficial deposits with a description of surficial stratigraphy in the Nevada Test Site region: U.S. Geological Survey Open-File Report 81–512, 27 p.

Izett, G. A., 1982, The Bishop ash bed and some older compositionally similar ash beds in California, Nevada, and Utah: U.S. Geological Survey Open-File Report 82–582, 47 p.

Maldonado, Florian, 1985, Geologic map of the Jackass Flats area, Nye County, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I–1519, scale 1:48,000

Orkild, P. P., and O'Conner, J. T., 1970, Geologic map of the Topopah Spring quadrangle, Nye County, Nevada: U.S. Geological Survey Geologic Quadrangle Map GQ–849, scale 1:24,000

Rosholt, J. N., Bush, C. A., Carr, W. J., Hoover, D. L., Swadley, W. C., and Dooley, J. R., Jr., 1985, Uranium-trend dating of Quaternary deposits in the Nevada Test Site area, Nevada and California: U.S. Geological Survey Open-File Report 85–540, 72 p.

Swadley, W. C., 1983, Map showing surficial geology of the Lathrop Wells quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I–1361, scale 1:48,000

Swadley, W. C., and Carr, W. J., 1987, Geologic map of the Quaternary and Tertiary deposits of the Big Dune quadrangle, Nye County, Nevada, and Inyo County, California: U.S. Geological Survey Miscellaneous Investigations Series Map I–1767, scale 1:48,000

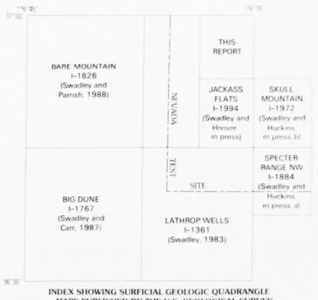
Swadley, W. C., and Hoover, D. L., in press, Geologic map of the surficial deposits of the Jackass Flats quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I–1994, scale 1:24,000

Swadley, W. C., Hoover, D. L., and Rosholt, J. N., 1984, Preliminary report on late Cenozoic faulting and stratigraphy in the vicinity of Yucca Mountain, Nye County, Nevada: U.S. Geological Survey Open-File Report 84–788, 42 p.

Swadley, W. C., and Huckins, H. E., in press a, Surficial geologic map of the Specter Range NW quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I–1884, scale 1:24,000

———in press b, Geologic map of the surficial deposits of the Skull Mountain quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I–1972, scale 1:24,000

Swadley, W. C., and Parrish, L. D., 1988, Surficial geologic map of the Bare Mountain quadrangle, Nye County, Nevada: U.S. Geological Survey Miscellaneous Investigations Series Map I–1826, scale 1:48,000


BARE MOUNTAIN I-1826 (Swadley and Parrish, 1988)
THIS REPORT
WITCH'S
JACKASS FLATS I-1994 (Swadley and Hoover, in press)
SKULL MOUNTAIN I-1972 (Swadley and Huckins, in press, b)
TESTSITE
SITE
SPECTER RANGE NW I-1884 (Swadley and Huckins, in press, a)
BIG DUNE I-1767 (Swadley and Carr, 1987)
LATHROP WELLS I-1361 (Swadley, 1983)

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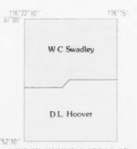

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